

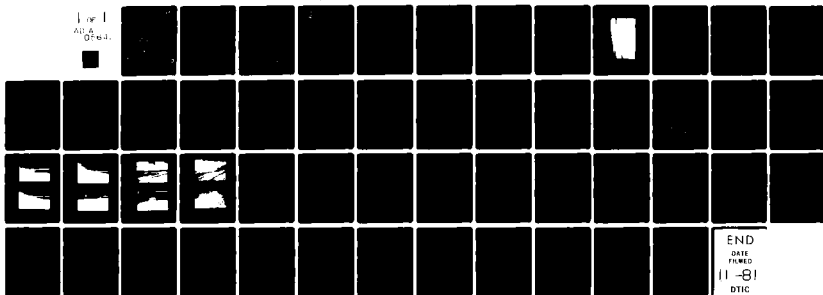
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NATIONAL DAM SAFETY PROGRAM, COOL VALLEY LAKE DAM (NO 10934), M--ETC(U)  
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**COOL VALLEY LAKE DAM**

**MONTGOMERY COUNTY, MISSOURI**

**MO. 10934**

**PHASE 1 INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM**

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**United States Army  
Corps of Engineers**

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**St. Louis District**

**PREPARED BY: U.S. ARMY ENGINEER DISTRICT, ST. LOUIS**

**FOR: STATE OF MISSOURI**

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.		

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COOL VALLEY LAKE DAM  
MONTGOMERY COUNTY, MISSOURI  
MO. 10934

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

PREPARED BY  
HOSKINS-WESTERN-SONDEREGGER, INC.  
CONSULTING ENGINEERS  
LINCOLN, NEBRASKA

UNDER DIRECTION OF  
ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

JUNE, 1979

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DEPARTMENT OF THE ARMY  
ST. LOUIS DISTRICT, CORPS OF ENGINEERS  
210 NORTH 12TH STREET  
ST. LOUIS, MISSOURI 63101

IN REPLY REFER TO

SUBJECT: Cool Valley Lake Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Cool Valley Lake Dam:

It was prepared under the National Program of Inspection of Non-Federal Dams

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

- 1) Spillway will not pass 50 percent of the Probable Maximum Flood.
- 2) Overtopping could result in dam failure.
- 3) Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY:	<b>SIGNED</b>	<b>24 SEP 1979</b>
	Chief, Engineering Division	Date
APPROVED BY:	<b>SIGNED</b>	<b>24 SEP 1979</b>
	Colonel, CE, District Engineer	Date

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM

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PHASE I REPORT  
NATIONAL DAM SAFETY PROGRAM  
ASSESSMENT SUMMARY

Name of Dam	Cool Valley Lake Dam
State Located	Missouri
County Located	Montgomery County
Stream	Price's Branch
Date of Inspection	June 28, 1979

Cool Valley Lake Dam was inspected by an interdisciplinary team of engineers from Hoskins-Western-Sonderegger, Inc. The purpose of the inspection was to make an assessment of the general conditions of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and State agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. Failure would threaten life and property. The estimated damage zone extends approximately two miles downstream of the dam. Within the damage zone are one dwelling, some outbuildings, and 3 county roads.

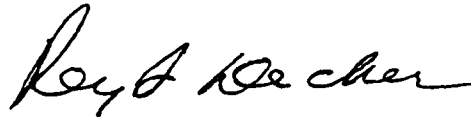
Our inspection and evaluation indicates that the spillway does not meet the criteria set forth in the recommended guidelines for a small dam having a high hazard potential. Considering the volume of water impounded and the downstream hazards, one-half of the Probable Maximum Flood is the appropriate spillway design flood. The spillways will pass the 100-year flood (flood having a one percent chance of being exceeded in any year) without overtopping the dam. The spillways will pass 30% of the Probable Maximum Flood without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

No design data were available for this dam. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These analyses should be obtained in the future.



Other than a heavy growth of trees and brush in the exit channel, no other deficiencies were found. The dam appears to be in excellent condition.

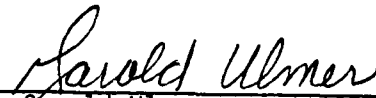
Maintenance of this dam is excellent.



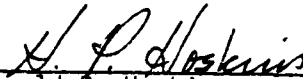
Rey S. Decker  
E-3703



Gordon Jamison



Garold Ulmer  
E-4777



Harold P. Hoskins  
Chairman of Board  
Hoskins-Western-Sonderegger, Inc.  
E-8696



PHOTO NO. 1 - OVERVIEW

PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
COOL VALLEY LAKE DAM - MO 10934  
MONTGOMERY COUNTY, MISSOURI

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

- a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Cool Valley Lake Dam be made.
- b. Purpose of Inspection. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.
- c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams", Appendix D to "Report of the Chief of Engineers on the National Program of Inspection of Dams", dated May, 1975, and published by the Department of the Army, Office of the Chief of Engineers.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances.
  - (1) The dam is an earthfill approximately 900 feet in length and about 20 feet in height. It is located in gently rolling hills with loess capping the uplands and glacial till in the valley slopes. The valley slopes and bottoms are mantled by loess-derived colluvium and alluvium. The probable foundation materials are thin alluvial and colluvial silty clays and thick glacial till.
  - (2) The principal spillway consists of a 72-inch diameter riveted steel boiler plate riser connected with a 72-inch diameter boiler plate riveted outlet conduit.
  - (3) A vegetated earth emergency spillway is cut through the left (west) abutment.
  - (4) Pertinent physical data are given in paragraph 1.3 below.

- b. Location. The dam is located in the east central portion of Montgomery County, Missouri, as shown on Plate A-2. The dam is shown on Plate A-1 in the NW  $\frac{1}{4}$  of Section 2, T47N, R4W and the NE  $\frac{1}{4}$  of Section 3, T47N, R4W. The lake formed behind the dam is shown in the NW  $\frac{1}{4}$  of Section 2, T47N, R4W, and the NE  $\frac{1}{4}$  of Section 3, T47N, R4W.
- c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in guidelines referenced in paragraph 1.1c above. Based on these criteria, this dam and impoundment is in the small size category.
- d. Hazard Classification. Guidelines for determining the hazard classification are presented in the same guidelines as referenced in paragraph 1.1c above. Based on referenced guidelines, this dam is in the High Hazard Classification. The estimated damage zone extends for about two miles downstream and includes one dwelling, some outbuildings and 3 county roads.
- e. Ownership. The dam is owned by Ray Oetting, P.O. Box 177, Jonesburg, Missouri 63351.
- f. Purpose of Dam. The dam was constructed for flood retardation and erosion control.
- g. Design and Construction History. It was reported by Mrs. Ray Oetting that the dam was constructed in 1972 or 1973. A core trench was excavated and backfilled during construction. No other information on design and construction was available.
- h. Normal Operating Procedure. It was reported by Mr. Oetting that the reservoir is drawn down occasionally to provide irrigation water for a downstream landowner. The reservoir is drawn down by a 12-inch gate valve located in the principal spillway.

### 1.3 PERTINENT DATA

- a. Drainage Area. 519 acres (0.811 square miles).
- b. Discharge at Damsite.
  - (1) All discharges at the damsite are through a principal spillway consisting of a 72-inch diameter riveted steel riser connected to a 72-inch diameter riveted steel outlet pipe and through a grassed earth channel ungated emergency spillway. A 12-inch diameter gate valve is located within the 72-inch diameter outlet pipe for a drawdown mechanism. There are no seepage collars located on the outlet pipe.

- (2) Estimated maximum flood at damsite -- unknown.
- (3) The principal spillway capacity varies from 0 c.f.s. at elevation 856.0 to 215 c.f.s. at the crest of the emergency spillway (elevation 858.5) to 272 c.f.s. at the minimum top of dam (elevation 860.0).
- (4) The emergency spillway capacity varies from 0 c.f.s. at its crest elevation 858.5 to 160 c.f.s. at elevation 860.0 (minimum top of dam).
- (5) Total spillway capacity at the minimum top of dam is 432 c.f.s.  $\pm$ .

c. Elevations (feet above M.S.L.).

- (1) Top of dam - 860  $\pm$
- (2) Principal spillway crest - 856  $\pm$
- (3) Emergency spillway crest - 858.5  $\pm$
- (4) Streambed at centerline - 840  $\pm$
- (5) Maximum tailwater - unknown

d. Reservoir. Length (feet) of maximum pool - 3,300  $\pm$ .

e. Storage (Acre-feet).

- (1) Top of dam - 428  $\pm$
- (2) Principal spillway crest - 203  $\pm$

f. Reservoir Surface (Acres).

- (1) Top of dam - 76  $\pm$
- (2) Principal spillway crest - 38  $\pm$

g. Dam.

- (1) Type - Earthfill
- (2) Length - 900 ft.  $\pm$
- (3) Height - 20 ft.  $\pm$
- (4) Top width - 9 ft.  $\pm$
- (5) Side slopes.
  - (a) Downstream - 3.8H on 1V (measured)
  - (b) Upstream - 4.2H on 1V (measured on exposed slope to the top of riprap)
- (6) Zoning - unknown
- (7) Impervious core - unknown
- (8) Cutoff - Reported by Jeff Oetting, Mr. Oetting's son, that an earth backfilled cutoff trench was constructed.
- (9) Grout curtain - unknown
- (10) Wave protection - limestone riprap
- (11) Internal drainage system - none

h. Diversion Channel and Regulating Tunnel. None

i. Spillway.

(1) Principal

(a) Type - Drop inlet with 72-inch steel diameter riser and 72-inch diameter steel outlet conduit.

(b) Crest (invert) elevation - 856.0 ft.  
Outlet - 843.8 ft.  $\pm$

(c) Length - 80 ft.  $\pm$

(2) Emergency

(a) Type - Vegetated earth cut into the left abutment.  
The spillway is well vegetated with adapted grasses.

(b) Control section - Broad crested weir located about 75 ft. downstream from the reservoir.

(c) Crest elevation - 858.5 ft.

(d) Upstream channel - Vegetated earth, clean, slope = 3.8%  $\pm$ .

(e) Downstream channel - Exit channel is well vegetated on slope of 3%+.

j. Regulating Outlets. 12-inch gate valve on a 12-inch cast iron drawdown pipe located about 12 feet upstream from the riser within the 72-inch diameter outlet pipe.

## SECTION 2 - ENGINEERING DATA

### 2.1 DESIGN

No design data were available for this dam.

### 2.2 CONSTRUCTION

No construction data were available. It was reported by Mrs. Ray Oetting that the dam was built in 1972 or 1973. The upstream slope was ripped in 1977.

### 2.3 OPERATION

No data were available on spillway operation. It was reported by Mrs. Oetting that the emergency spillway has never operated. The reservoir can be and has been drawn down to supply irrigation water for a downstream landowner.

### 2.4 EVALUATION

- a. Availability. No data were available.
- b. Adequacy. The field surveys and visual observation presented herein are considered adequate to support the conclusions of this report. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions (including earthquake loads) and made a matter of record.
- c. Validity. Not applicable.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

- a. General. A visual inspection of the Cool Valley Lake Dam was made on June 28, 1979. Engineers from Hoskins-Western-Sonderegger, Inc., Lincoln, Nebraska making the inspection were: R.S. Decker, Geotechnical, Gordon Jamison, Hydrology, and Garold Ulmer, Civil Engineer.
- b. Dam.
  - (1) Geology and Soils (abutment and embankment). This dam is located on gently rolling topography with the uplands mantled with CL-silty clay loess overlying a thick sequence of probable Kansan till. Bedrock is not exposed in the region. Loess-derived colluvium and alluvium mantle the valley sides and bottom. No exposures of glacial till were observed on the site.
  - (2) Upstream Slope. The upstream slope is riprapped with durable limestone. The riprap has a nominal size of 6 to 8 inches and extends to about elevation 856.5 to 857 feet. The slope above the riprap is well vegetated. The upstream slope appears to be adequately protected against erosion. No slides, deformations or significant erosion was observed on the upstream slope. Muskrats have been active on the dam but the owner actively traps these rodents and no rodent holes were observed.
  - (3) Crest. The crest is well vegetated with adapted grasses. No cracks, potholes or deformations were noted.
  - (4) Downstream Slope. The downstream slope is well vegetated with adapted grasses. No cracks, seepage or deformations were observed on the downstream slope or along the toe of the dam.
  - (5) Miscellaneous. Materials in the surface 2 feet of the dam and downstream slope consist of plastic silty clay in the CL-CH borderline area between high and medium plasticity. The borrow area was probably located in the alluvium or colluvium within the present reservoir area. Because of the plastic nature of the soil in the embankment it appears this dam could withstand prolonged overtopping without serious damage.



c. Appurtenant Structures.

- (1) The principal spillway consists of a 72-inch diameter riser connected with a 72-inch diameter outlet conduit. The riser and conduit are heavy riveted boiler plate tubing which appeared to be in good condition. The 72-inch diameter conduit is compressed and deformed into an oval shape with a vertical diameter of 5 ft. + under the maximum section of the dam. This is possibly due to settlement of the embankment. However, no leakage was observed around the rivets in the deformed section. The reservoir level was just below the inlet elevation of the riser when inspected.
- (2) The emergency spillway is a well vegetated earth channel cut through the left abutment. It was reported by Mrs. Oetting that the emergency spillway has never operated. The exit channel parallels the toe of the dam. Spillway flows would not endanger the safety of the dam.
- (3) Drawdown Facilities. A 12-inch diameter cast iron draw-down pipe extends about 25 feet from the spillway riser into the reservoir. The facility is controlled by a 12-inch valve located just inside the riser. The drawdown valve is operable and has been used in the past two years.

d. Reservoir Area. The shoreline is surrounded by pasture. Some minor erosion was noted around the shoreline but it did not appear to be significant. A farm pond impounds the drainage from a southeast tributary and releases directly into the reservoirs.

e. Downstream Channel. The channel downstream from the structure is overgrown with trees and brush.

3.2 EVALUATION

This dam appears to be in generally good to excellent condition. Embankment slopes should provide adequate safety against shear failures for a dam of this height. There is no evidence of seepage on the downstream slope or toe nor any evidence of abnormal deformation. Materials in the dam and the excellent vegetative cover indicate that this dam could withstand significant overtopping without potential of failure. The trees and brush should be cleared from the downstream channel. Periodic inspections, coupled with continued proper maintenance, should be made.

## SECTION 4 - OPERATIONAL PROCEDURES

### 4.1 PROCEDURES

There is a 12-inch diameter drawdown pipe with 12-inch valve installed in this dam. The reservoir can be and has been drawn down to supply irrigation water for use downstream and/or for repairs to the dam. The last drawdown occurred about 2 years ago when the riprap was placed on the upstream slope.

### 4.2 MAINTENANCE OF DAM

Maintenance of the dam and appurtenances appears to be excellent.

### 4.3 MAINTENANCE OF OPERATING FACILITIES

Drawdown facilities are operable as required and maintenance appears to be excellent.

### 4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

Upon checking with the owner, we are not aware of any warning system in effect for this dam.

### 4.5 EVALUATION

There does not appear to be any potential of failure of this structure.

## SECTION 5 - HYDRAULIC/HYDROLOGIC

### 5.1 EVALUATION OF FEATURES

- a. Design Data. No design data were found for this dam. Therefore, all computations are based on field inspection and surveys performed by the consultant. The plan, profiles, and cross sections from the survey are attached in Appendix C.
- b. Experience Data. The drainage area, reservoir surface area, and elevation-storage data were developed from the USGS Jonesburg, Missouri 7 1/2 minute topographic quadrangle map. The hydraulic computations for the spillway and dam overtopping discharge ratings were based on data collected in the field at the time of the field inspection.
- c. Visual Observations.
  - (1) Principal spillway appeared to be in good condition. Some deformation of the outlet pipe was noted and was probably due to the settlement of the embankment.
  - (2) The emergency spillway is located in the left abutment. The spillway releases flow along the downstream toe of dam but will not endanger the integrity of the dam.
  - (3) The downstream channel appeared to be badly choked with trees and brush.
  - (4) A 12-inch gate valve located in the principal spillway is available to evacuate the pool. It was reported by Jeff Oetting to be operable.
- d. Overtopping Potential. The spillways are too small to pass 50% of the probable maximum flood without overtopping. The spillways will pass 30% of the probable maximum flood without overtopping. The 100-year (1 percent) peak outflow discharge is approximately 42% of the spillway capacity. Materials in this dam and the excellent vegetative cover indicate that the dam could withstand significant overtopping without potential of failure. The results of the routings through the dam are tabulated in regards to the following conditions.

<u>Frequency</u>	<u>Inflow Discharge c.f.s.</u>	<u>Outflow Discharge c.f.s.</u>	<u>Maximum Pool Elevation</u>	<u>Freeboard Top of Dam Min. Elev. 860.0</u>	<u>Time Dam Overtopping Hr.</u>
100 Yr.	1,500	180	858.2	+1.8	0
1/2 PMF	3,400	2,500	860.8	-0.8	3+
PMF	6,800	5,600	861.5	-1.5	5+
0.3 PMF	1,900	430	860.0	0	0

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and a small size. Therefore, the 1/2 PMF to the PMF is the test for the adequacy of the dam and its spillway.

The estimated damage zone is described in Paragraph 1.2d in this report.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observation. This dam appears to be structurally stable. Additional studies would be necessary to determine the effect of overtopping on the structural stability, but it would appear that prolonged overtopping would not impair the stability of the dam.
- b. Design and Construction Data. No design or construction data were available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.
- c. Operating Records. There are no operating records for this dam. It was reported by Mrs. Oetting that the reservoir was drawn down 6' to 7' in 1977.
- d. Post Construction Changes. It was reported by Mrs. Oetting that the reservoir was drawn down in 1977 and that the upstream slope was riprapped at that time.
- e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of the magnitude predicted in this area is not expected to cause structural failure of this dam.

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

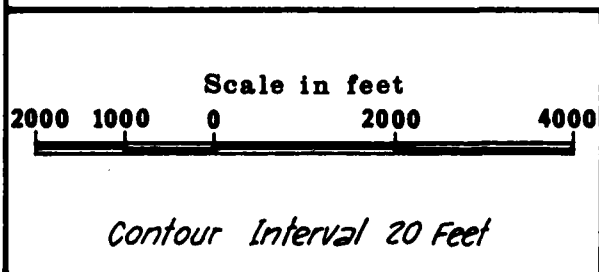
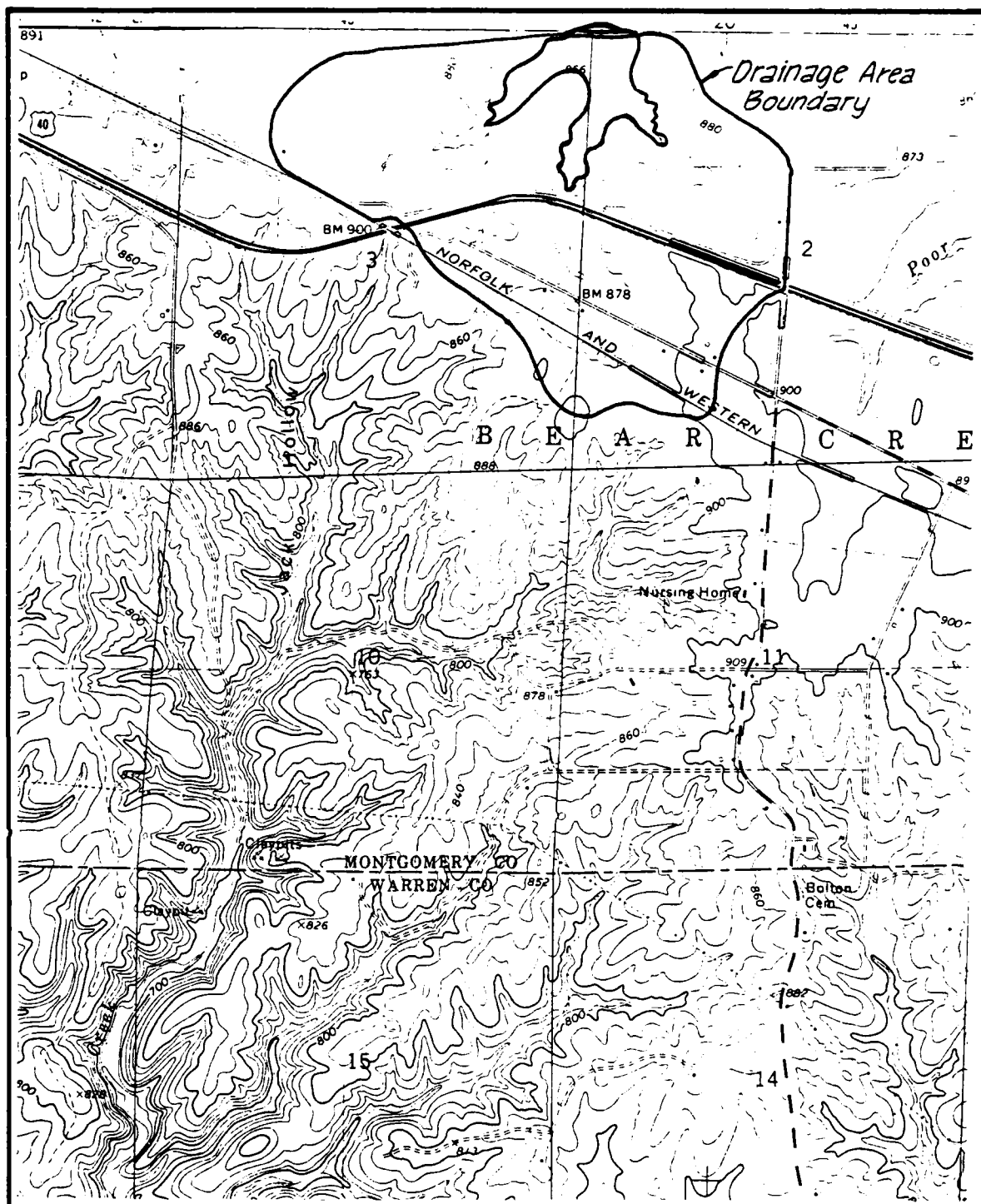
### 7.1 DAM ASSESSMENT

- a. Safety. There does not appear to be a potential of failure of this dam. The spillways will not pass 50% of the probable maximum flood without overtopping. Additional studies would be required to determine the adverse affects and/or potential of failure from overtopping of this dam.
- b. Adequacy of Information. Due to the lack of engineering data, the conclusions in this report are based upon performance history and visual observations. Seepage and stability analyses comparable to the requirements of the guidelines were not available which is considered a deficiency.
- c. Urgency. The item recommended in paragraph 7.2a should be pursued on a high priority basis.
- d. Necessity for Phase II. Phase II investigation is not considered necessary.
- e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of this magnitude is not expected to be hazardous to this dam.

### 7.2 REMEDIAL MEASURES

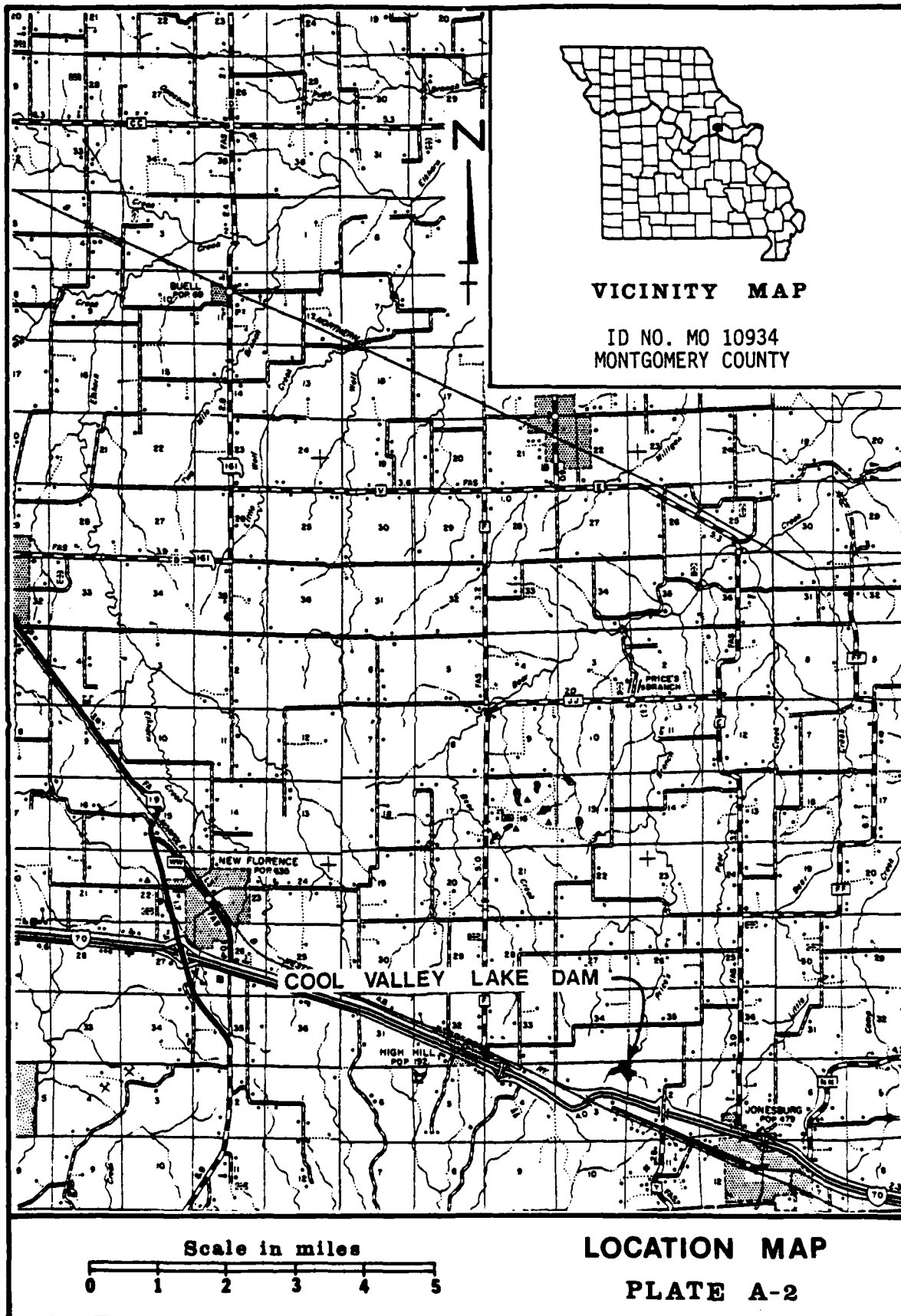
- a. Alternatives. Additional information should be obtained on the topographic characteristics of the reservoir area to determine the increase in the height of dam or the size of the spillway that is necessary to pass one half the Probable Maximum Flood without overtopping the dam. The services of an engineer experienced in the design and construction of dams should be obtained to evaluate the present reservoir storage capacity, to provide seepage and stability and analyses (including earthquake loading) of the present dam, and to design protective measures, if required.
- b. O & M Procedures. Maintenance and operating procedures seem to be adequate for this dam. After cleaning the downstream channel further periodic inspections should be made.

APPENDIX A  
MAPS

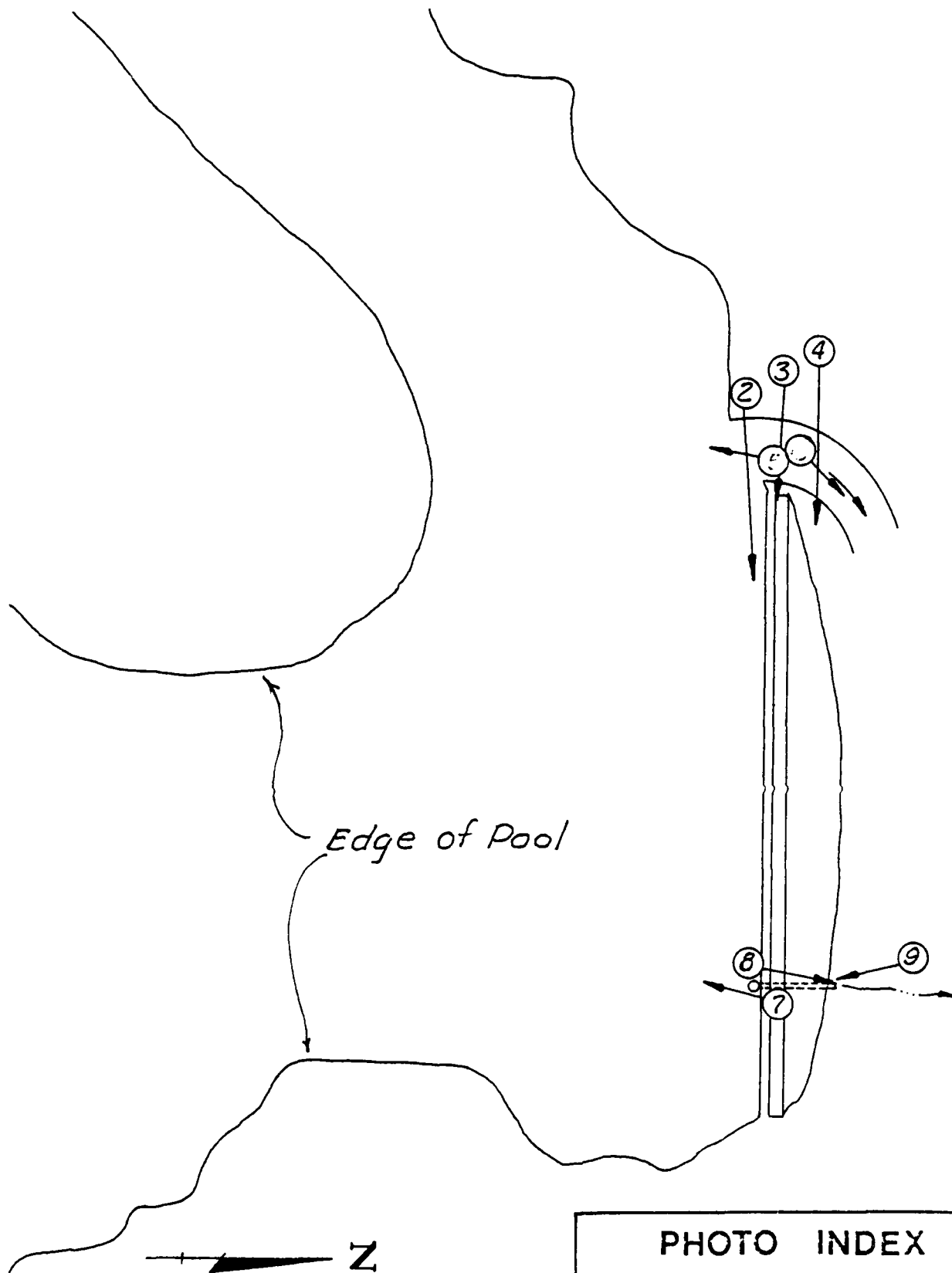


**VICINITY TOPOGRAPHY**  
 COOL VALLEY LAKE DAM  
 MONTGOMERY COUNTY, MO.  
 MO. 10934  
**PLATE A-1**





APPENDIX B  
PHOTOGRAPHS



### PHOTO INDEX

COOL VALLEY LAKE DAM

MONTGOMERY COUNTY, MISSOURI

MO. 10934

PLATE B-1



PHOTO NO. 2 - UPSTREAM SLOPE FROM LEFT ABUTMENT



PHOTO NO. 3 - CREST OF DAM



PHOTO NO. 4 - DOWNSTREAM SLOPE FROM LEFT ABUTMENT



PHOTO NO. 5 - LOOKING UPSTREAM IN EMERGENCY SPILLWAY



PHOTO NO. 6 - LOOKING DOWNSTREAM IN EMERGENCY SPILLWAY



PHOTO NO. 7 - PRINCIPAL SPILLWAY RISER



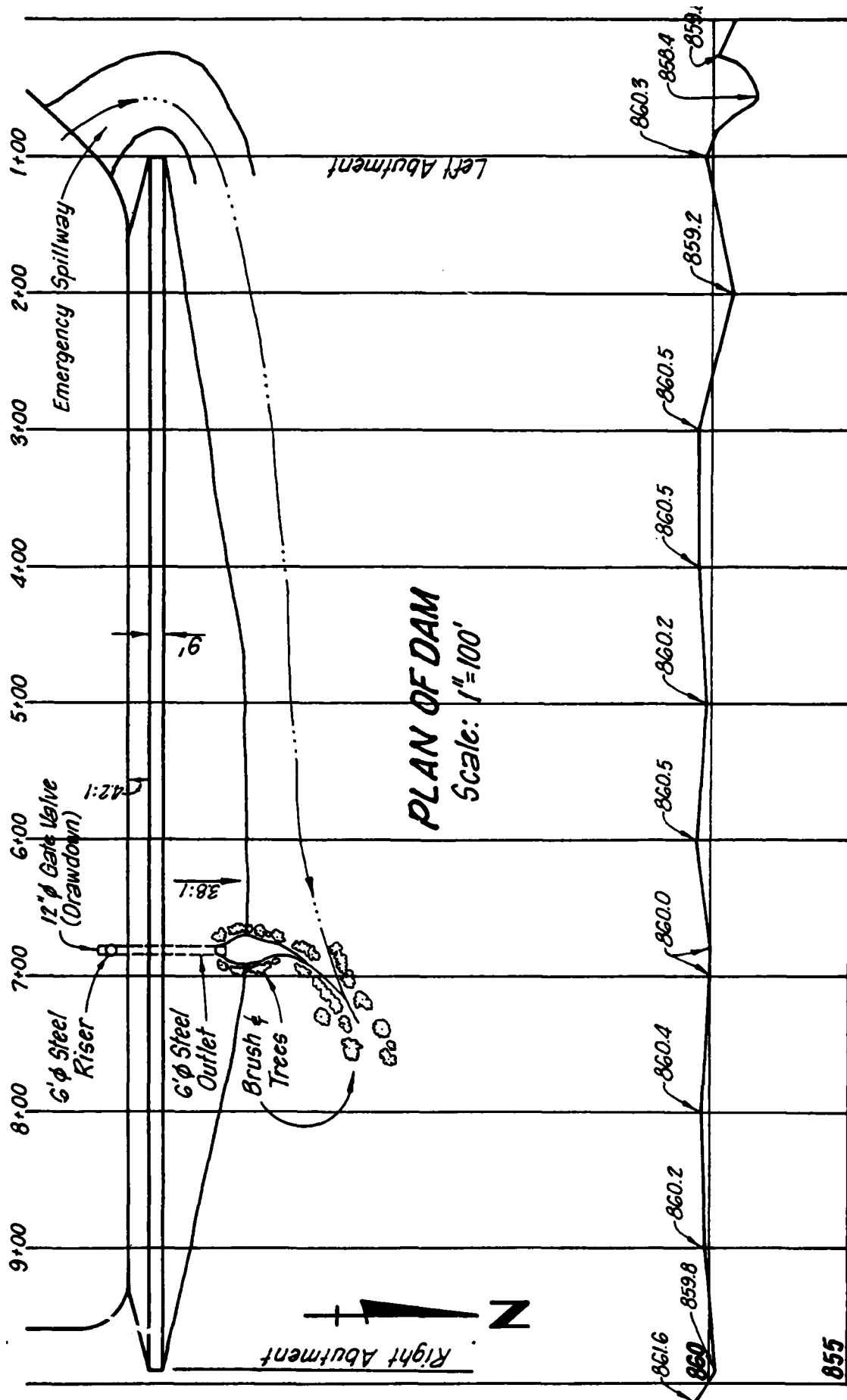
PHOTO NO. 8 - OUTLET OF PRINCIPAL SPILLWAY IN CENTER OF  
PICTURE

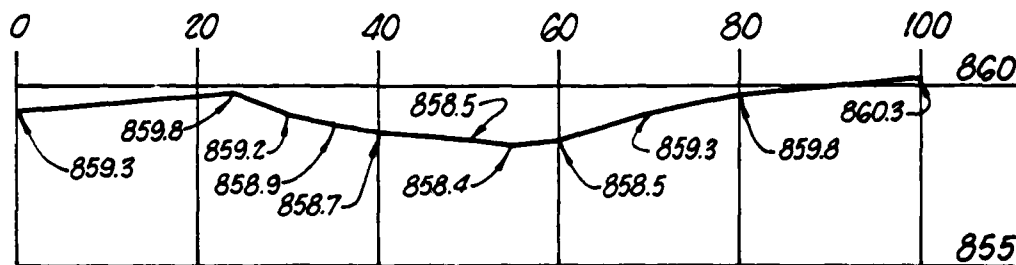
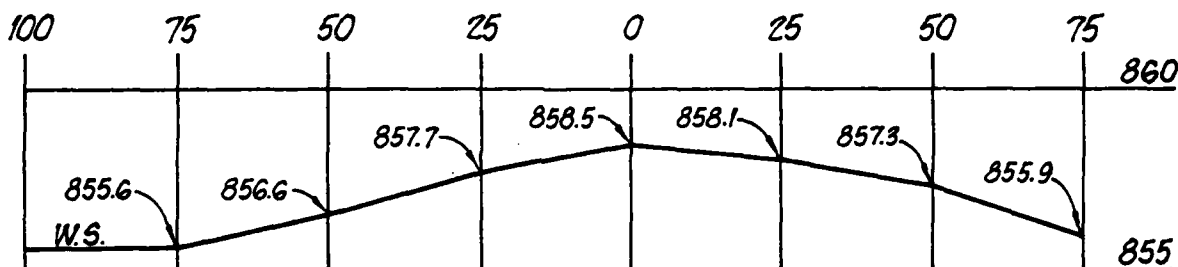
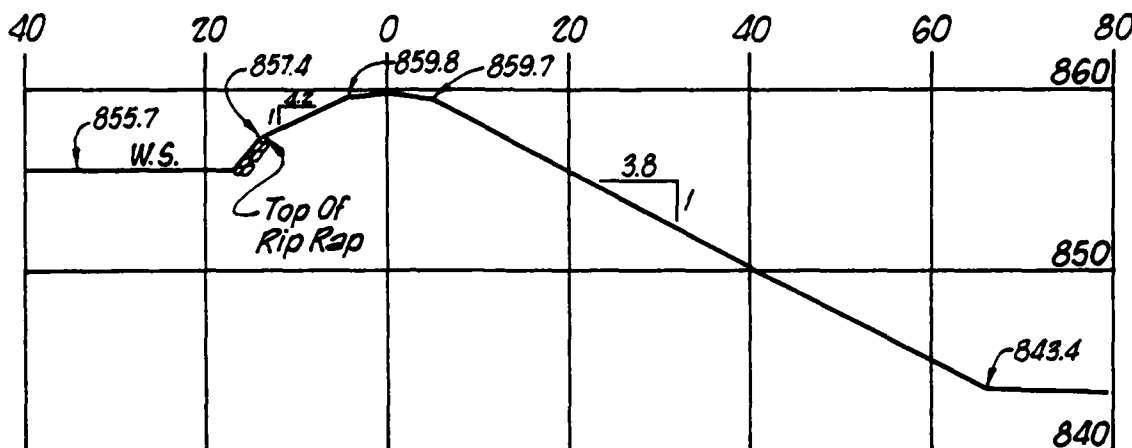


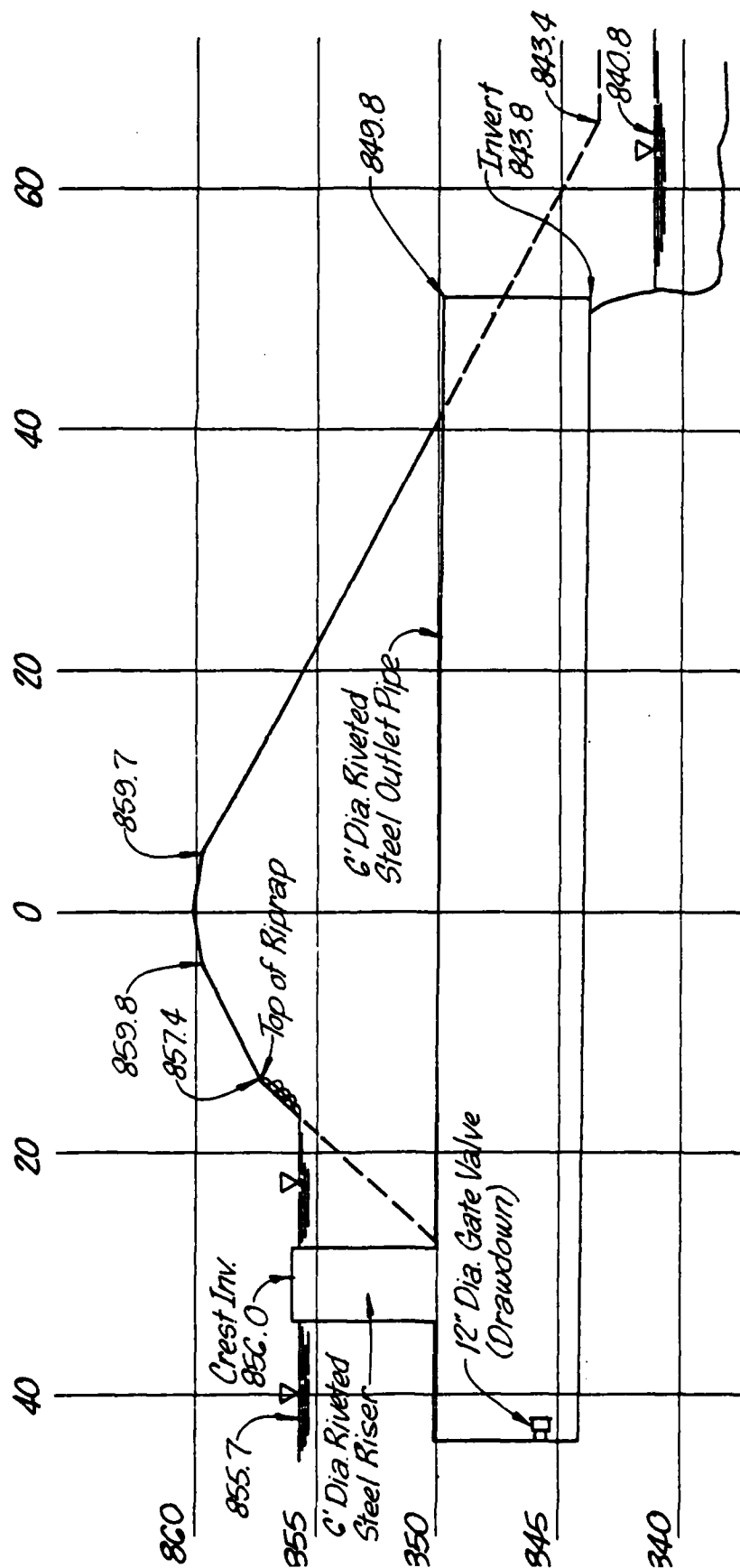
PHOTO NO. 9 - OUTLET END OF PRINCIPAL SPILLWAY

APPENDIX C  
PROJECT PLATES









SECTION @ STA. 6+80  
 SHOWING PRINCIPAL SPILLWAY  
 Scale: As Shown

APPENDIX D  
HYDRAULIC AND HYDROLOGIC DATA

## HYDROLOGIC COMPUTATIONS

1. The SCS dimensionless unit hydrograph and the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Corps of Engineers, Davis, California, were used to develop the inflow hydrographs (See this section).
  - a. Twenty-four hour, 100-year rainfall for the dam location were taken from the data for the rainfall station at Sullivan, Mo. as supplied by the St. Louis District, Corps of Engineers per their letter dated 6 March 1979. The twenty-four hour probable maximum precipitation was taken from the curves of the Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis policy and guidance for hydraulics and hydrology.
  - b. Drainage area = 0.811 square miles (519 acres).
  - c. Time of concentration of runoff = 36 minutes (computed from Kirpich formula).
  - d. The antecedent storm conditions for the probable maximum precipitation were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMC III). The antecedent storm conditions for the 100-year precipitation were an average of the conditions which have preceded the occurrence of the maximum annual flood on numerous watersheds (SCS AMC II). The initial pool elevation was assumed at the crest of the principal spillway riser.
  - e. The total twenty-four hour storm duration losses for the 100-year storm were 3.09 inches. The total losses for the PMF storm were 1.73 inches. These data are based on SCS runoff curve No. 87 and No. 73 for antecedent moisture conditions, SCS AMC III and AMC II respectively. The watershed is composed of soils from the SCS soil groups C and D (Armster, and Mexico Soils) and consists primarily of pasture with some cropland. The SCS curve numbers were adjusted to reflect the effect of a small dam on the upper portion of the watershed.
  - f. Average soil loss rates = 0.07 inch per hour approximately (for PMF storm, AMC III).
2. The combined discharge rating consisted of three components: the flow through the principal spillway, the flow through the emergency spillway and the flow going over the top of the dam.

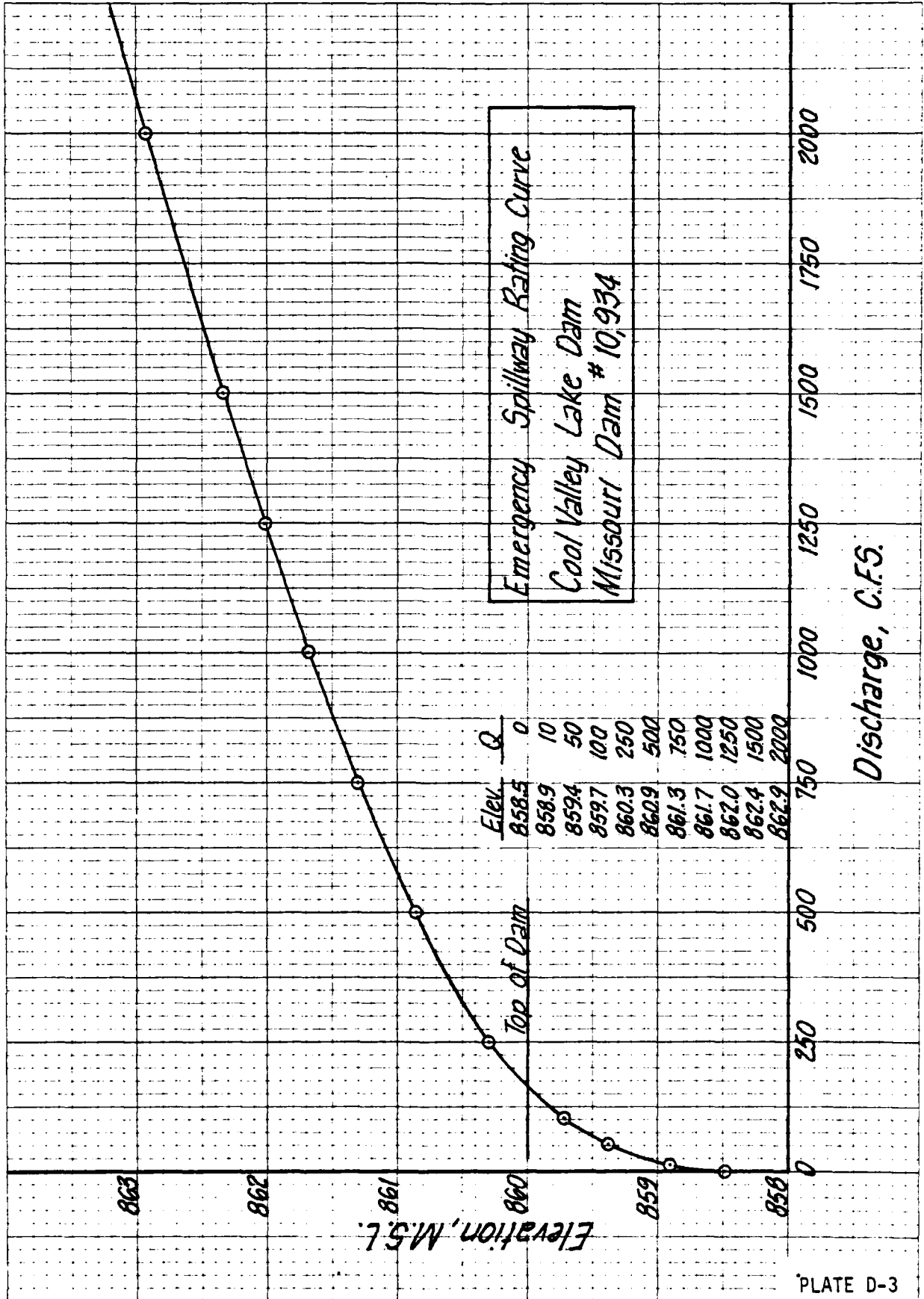
The principal spillway rating was developed using standard weir, orifice, and full conduit flow equations. In determining the rating, it was discovered that the weir and orifice conditions control, whereas the full conduit flow never develops. The weir and orifice equations are as follows:

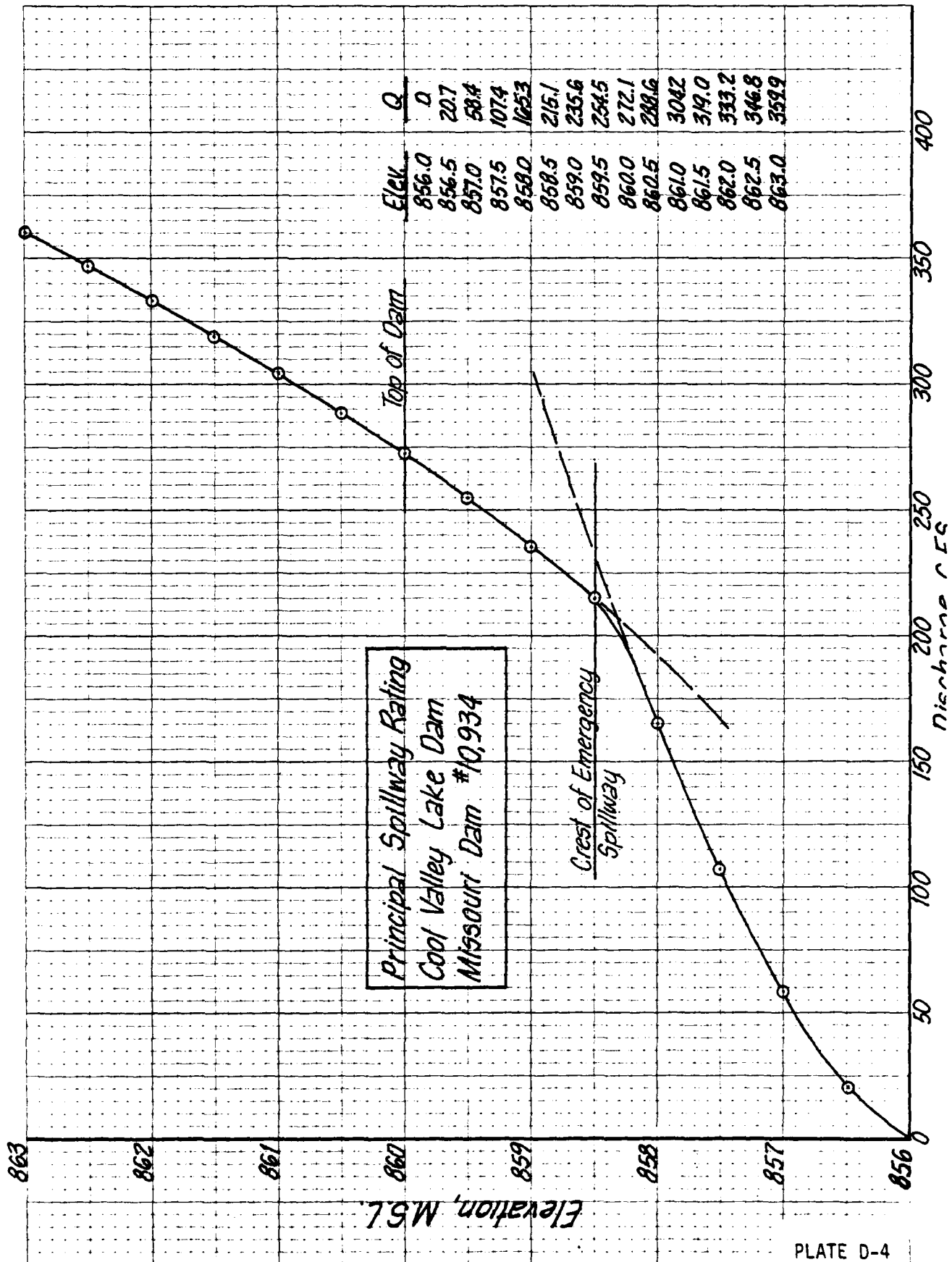
- a. Weir flow equation -  $Q = CLH^{3/2}$   
where C = weir coefficient = 3.1  
L = weir length, ft. = 18.85  
H = total head, ft.
- b. Orifice equation -  $Q = CA\sqrt{2gh}$   
where C = orifice coefficient = 0.6  
A = area of riser, sq. ft. = 28.27  
h = total head, ft.

The emergency spillway discharge rating was developed using the Corps of Engineers Surface Water Profile HEC-2 computer program.

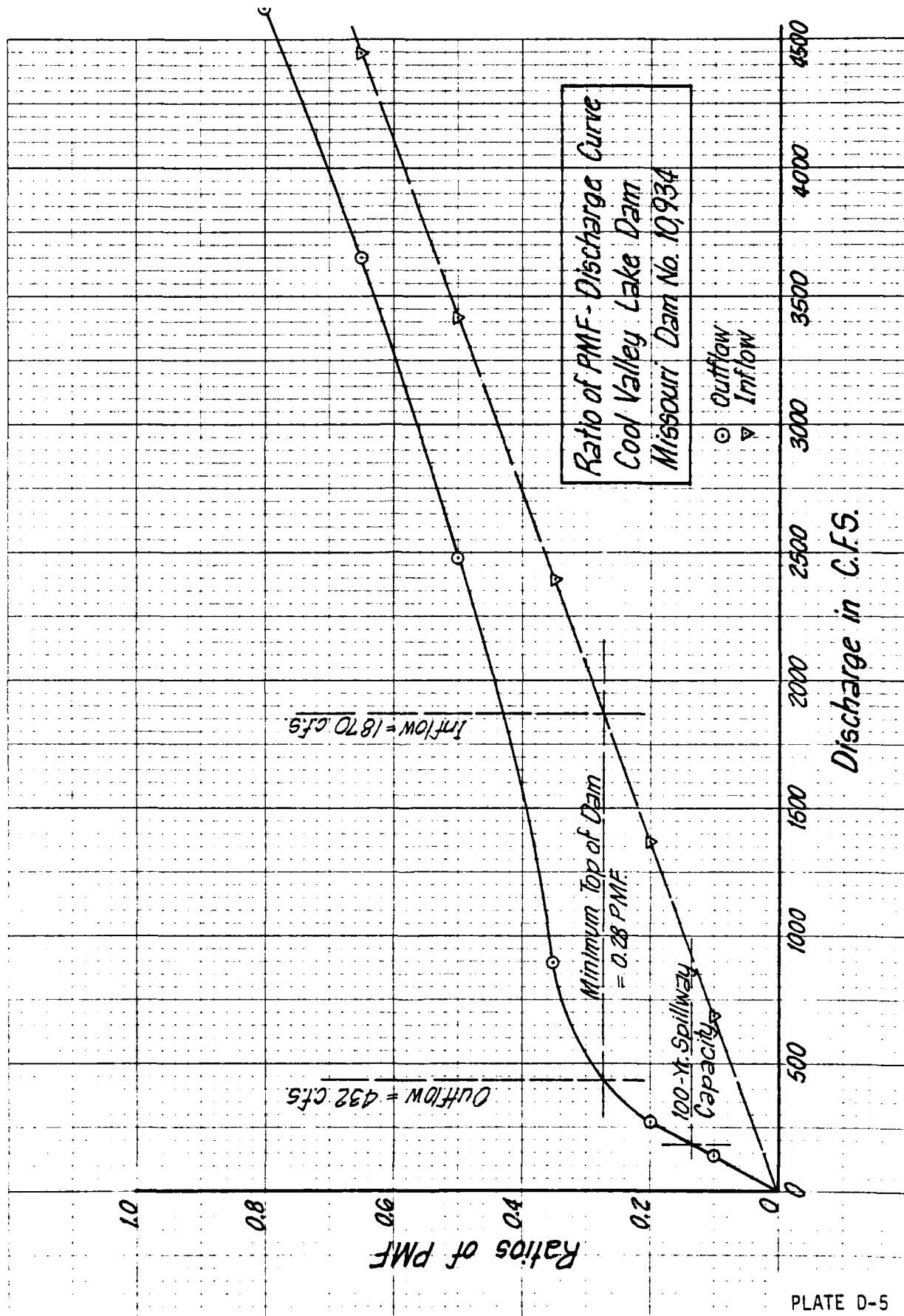
The flows over the dam were determined by using the dam overtopping analysis within the HEC-1 (Dam Safety Version) program.

3. Floods were routed through the reservoir using the HEC-1 (Dam Safety Version) program to determine the capabilities of the spillway and dam embankment crest. The output and plotted hydrographs are attached in this appendix.











# PMF Output

\*\*\*\*\*  
FLOOD HYDROGRAPH PACKAGE (HEC-1)  
FAN SAFETY VERSION JULY 1978  
LAST MODIFICATION 26 FEB 79  
\*\*\*\*\*

RUN DATE= 7/27/77  
TIME= 13:26:22

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF  
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF COLE VALLEY LAKE DAM-1973/36  
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

INQ	NIN	NMIN	TDAY	THR	THIN	MEIAC	IPUT	IPRT	MTAN
208	0	5		0	0	0	0	1	0
			JUPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSIS TO BE PERFORMED

RATIOS= .10 .20 .35 .50 .65 .80 1.00  
NPLAN= 1 NRATIO= 7

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF TREFLOW HYDROGRAPH TO 1973/36 RESERVOIR

ISTAQ	ICOMP	IEGPH	ITAPE	JPLT	JPRT	ISAME	ESTAGE	IAUTG
0000.1	0	0	0	0	0	0	1	0

HYDROGRAPH DATA

INQ	INQ	AREA	SWAP	TRSDA	TRSPC	RATIO	ISDOW	ISAME	LOCAL
1	2	.81	0.00	.81	1.00	0.000	0	1	

PRECIP DATA

SPEE	PHS	R6	R12	R24	R48	R72	R96
0.00	24.00	102.00	121.00	130.00	0.00	0.00	0.00

LOSS DATA

LROPT	STRR	ULTR	RTIO	FRATN	SWPKS	PLIOK	SIRL	CRSLC	ALSKK	PTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	-1.00	-07.00	0.00	0.00

CURVE NO = -87.00 METHOD = -1.00 EFFECT CR = RTIO

UNIT HYDROGRAPH DATA

IC= 0.00 LA= 0.00

PRECIPITATION DATA

STRT= 0.00 DRCST= -0.01 PTCR= 1.00

UNIT HYDROGRAPH 2% CBO OF PERIOD OPERATES, IC= 0.00 PTCR= 1.00 VOL= 1.00  
10% 320. 60% 920. 97% 87% 70% 64% 54% 44% 34% 24% 14% 0.00  
12% 17% 6% 4% 3% 2% 1% 0.00 0.00 0.00 0.00 0.00 0.00

ROUTED FROM: FROM 10-34, RESERVUAK

[illegible]

TOPIC	CODE	EXID	DATEID
660.0	3.6	1.5	23).

STATION JCSJ02, PLAN 1, RAIL 1

ΕΠΙΛΟΓΗ-ΠΡΟΤΕΚΤΟΝΗ ΠΥΛΟΚΕΤΕΣ ΟΥΚΙΝΑΤΕΣ

[illegible]

0.5 PMF

### STATISTICAL PLAN 1, RATIO 4

[illegible]



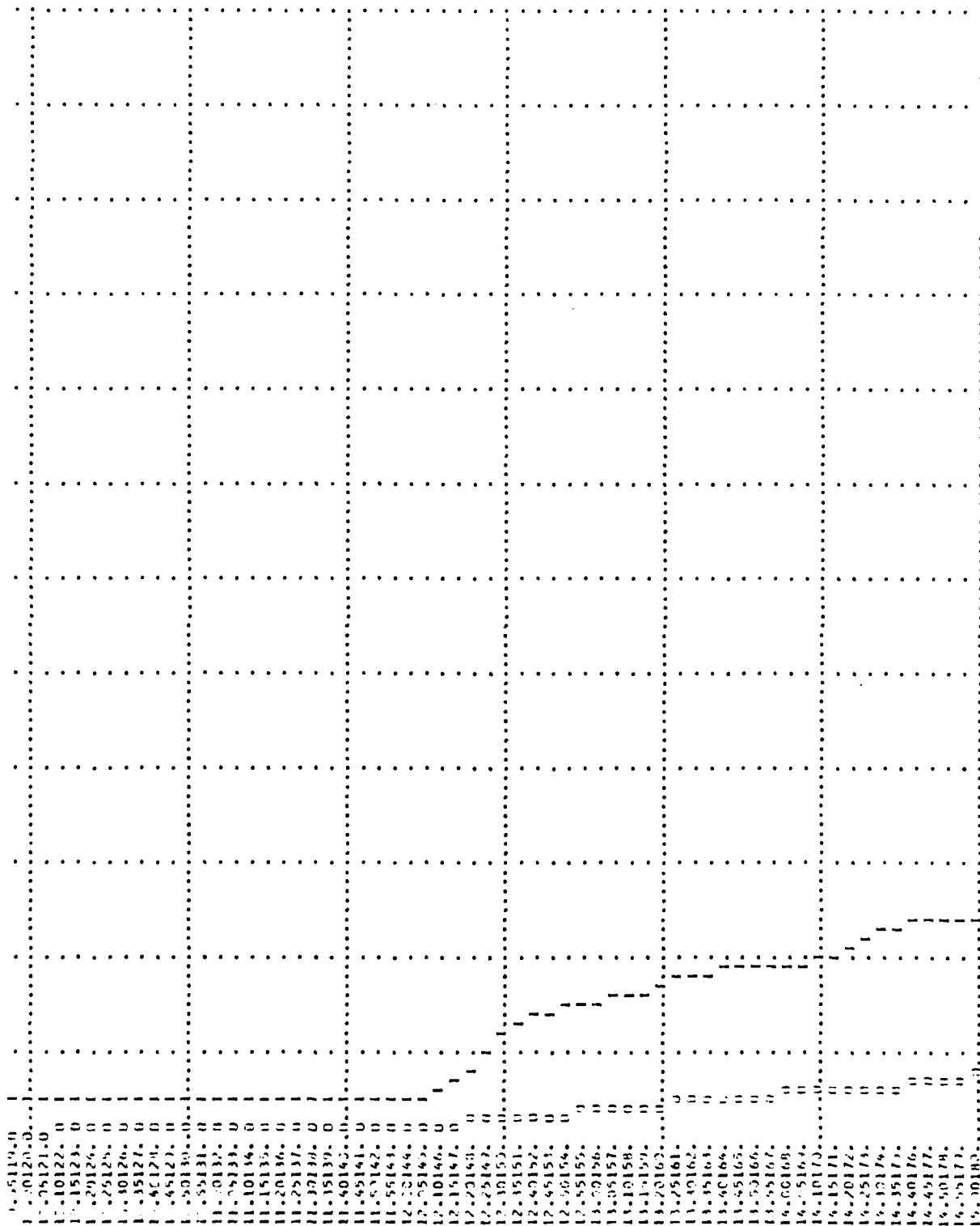
NOTE

STATION 000002

400.	800.	1200.	1600.	2000.	2400.	2800.	3200.	3600.	4000.
0.									
405	11								
410	21								
415	31								
420	41								
425	51								
430	61								
435	71								
440	81								
445	91								
450	101								
455	111								
460	121								
465	131								
470	141								
475	151								
480	161								
485	171								
490	181								
495	191								
500	201								
505	211								
510	221								
515	231								
520	241								
525	251								
530	261								
535	271								
540	281								
545	291								
550	301								
555	311								
560	321								
565	331								
570	341								
575	351								
580	361								
585	371								
590	381								
595	391								
600	401								
605	411								
610	421								
615	431								
620	441								
625	451								
630	461								
635	471								
640	481								
645	491								
650	501								
655	511								
660	521								
665	531								
670	541								
675	551								
680	561								
685	571								
690	581								
695	591								
700	601								









2025 RELEASE UNDER E.O. 14176

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)  
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIO	RATIOS APPLIED TO FLOWS						
					1	2	3	4	5	6	7
					.10	.20	.35	.50	.65	.80	1.00
HYDROGRAPH AT	000001	.81	1	684.	1368.	2393.	3419.	4445.	5471.	6810.	
	(	2.10)	(	19.36)	38.73)	67.77)	96.82)	125.86)	154.91)	193.64)	
MINUTED TO	000002	.81	1	141.	268.	896.	2474.	3651.	4613.	5055.	
	(	2.10)	(	4.00)	7.58)	25.37)	70.05)	103.39)	130.63)	165.81)	

# SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
STORAGE	856.00	856.00	860.00
OUTFLUM	203.	203.	428.
	0.	0.	432.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLUM CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLUM HOURS	TIME OF FAILURE HOURS
.10	857.79	0.00	285.	141.	0.00	18.08	0.00
.20	859.12	0.00	365.	268.	0.00	18.17	0.00
.35	860.27	.27	448.	896.	2.53	16.58	0.00
.50	860.75	.75	488.	2414.	3.25	16.17	0.00
.65	861.02	1.02	509.	3651.	4.17	16.08	0.00
.80	861.22	1.22	525.	4613.	4.92	16.08	0.00
1.00	861.46	1.46	545.	5855.	5.58	16.08	0.00

DATE  
FILMED  
-8